



# FAQ



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## General

Q: After failing to locate the leak with correlation and geophones what are the next steps before considering relining?

A: If traditional non-intrusive acoustic methods fail, our PipeMic Series can still yield impressive results. Since the PipeMic is introduced into the pipe itself it can pick up almost every noise, even with high ambient noise levels. Hydrogen tracer gas should also be considered as an application of last resort. This non-acoustic method can help to find even the smallest leaks and can be applied on empty and on live pipes (with our GasDiffuser).

Q: What are the difficulties for leak detection in densely populated cities in developing countries? What are the points to be considered? What are possible solutions?

A: A challenge we are often confronted with in developing countries is the lack of basic metering infrastructure, which is the necessary foundation for efficient water loss management. Municipalities often are not aware of the exact location of their water networks. Usually the customer's water consumption is not metered. The lack of metering makes it impossible to assess the water loss on a basic level and requires the installation of such infrastructure as a first step. The ZM Ultra can be a great temporary solution for such challenging projects. High ambient noise (even at night time) is another challenge densely populated areas. A solution can be our PipeMic because the probe gets very close to the leak. The PipeMic can lead to good results, even in loud environments.

Q: How can we fix a broken device?

A: We want to offer the best and quickest solution for you. If you have a malfunctioning device, please contact us to discuss the next steps.

## Flow Metering - ZM Ultra

Q: What are the dead zones before and after the sensors on the ZM Ultra for bends, corners and reductions?

A: 5 times the pipe diameter (DN) before and 3 times DN after the sensor.

Q: What pipe diameter range can the ZM Ultra be utilized for?

A: DN 50mm - 2500mm with the clamp on sensors.

Q: In what cases is it recommended to use 2 pairs of sensors for the measurement?

A: Using a second sensor pair will increase the accuracy. Especially when uncertain about turbulences inside the pipe, a second sensor pair can serve as a control.



Q: Can the ZM Ultra be installed on a permanent basis?

A: Absolutely. The ZM Ultra is very versatile and can be installed on a permanent basis. There are Special gel pads to use for the sensors for permanent installations.

Q: What are the operating temperatures of the ZM Ultra?

A:

Water temperature	0°C to 80°C
Clamp on sensors – operating temperature	-30°C to 80°C
ZM Ultra central unit – operating temperature	-30°C to 50°C

Q: What's the accuracy of the ZM Ultra with low velocity?

A: The ZM Ultra is very accurate even with very low velocities. The flow velocity accuracy is within a  $\pm 0.1\%$  path of the actual value.

Q: Can the ZM Ultra mobile measure other liquids than water?

A: Yes, basically any liquid flow can be measured. There are presets for water in the program, other liquids have to be configured manually.

Q: How to account for deposits on the bottom of the pipe?

A: There is the option to set a sludge level in the settings menu.

Q: Can the ZM Ultra measure the flow of gas?

A: Since gas has very different physical flow characteristics, only liquids can be measured.

Q: With the ZM Ultra GPRS version, where is the data transmitted to?

A: The data can be sent via email or to an FTP server.

Q: Is there a pipe wall thickness probe available?

A: Yes, a wall thickness probe can be purchased as an accessory.

Q: What is the maximum distance between the tablet/laptop/smartphone and the ZM Ultra to still have a good connection?



A: The ZM Ultra uses WiFi to connect to the mobile device. This WiFi connection has the usual range comparable with other WiFi routers.

Q: How often is the data transmitted via GPRS?

A: This can be custom set in the settings menu.

Q: Does the ZM Ultra support 4G?

A: Yes, 2G, 3G and 4G are supported with the GPRS version.

Q: What does it mean if the temperate displayed by the ZM Ultra differs significantly (more than 5°C) from the real water temperature?

A: The temperature displayed by the ZM Ultra is a calculated value, based on the time of flight of the ultrasonic sound waves. If the user input of the pipe parameters are correct, the calculated temperature should match the real temperature of the medium in the pipe. The temperature can therefore be a great control value if the right parameters were set.

Q: Can the ZM Ultra measure pipes with two different materials?

A: Yes, additionally to the pipe material a pipe lining can be specified in the settings.

Q: What coupling material is used for the clamp on sensors?

A: Either silicone grease for temporary use or silicone pads for permanent installation (Both included).

Q: What can be used to hold the sensors while clamped on to the pipe?

A: Reusable tensioning straps (2.5m long) are included. Other straps, chains and tensioners can be used.

Q: What signal strength is necessary for operation?

A: More than 60% signal strength should yield good results. Sufficient signal strength is indicated in green (Traffic light logic).

Q: What type of sensors are available for the ZM Ultra?

A: Our clamp on sensors can measure pipe diameters from 50mm to 2500mm.



Q: How to connect multiple analogue sensors to the multifunction sensor socket?

A: A single analogue or digital sensor can be connected directly to the multifunction socket. For more than one sensor there is a connector box available.

## Geophones - Aqua M Series

Q: Does the Aqua M60 have dynamic filters?

A: The Aqua M60 has 3 pre-set filter options.

Q: Can the Aqua M300 connect via Bluetooth?

A: To connect headphones via Bluetooth we offer a Bluetooth dongle. The sensors cannot be connected wirelessly. This is a deliberate design choice since wired connections have a higher sound quality and wireless connections offers very little additional convenience.

Q: What sensor should be used on grass or soft soil?

A: We advise to attach the tripod to the ground microphone in order to have a good connection between the ground and the sensor.

Q: How do different frequencies propagate in different materials?

A:

Sound propagation distance in Meters, depending on material and frequency			
	25 Hz	250 Hz	2500 Hz
Concrete	160	16	1.6
Clay	64	6.4	0.64
Soil	16	1.6	0.16
Sand	4	0.4	0.04

Q: How can noise levels from different ground materials be compared, to circle in a leak?

A: Comparison between noise levels are only possible with the same ground material. The noise levels should always be seen as relative, never as absolute values.

## Line Locating - PWG

Q: Can the PWG mode in the Aqua M300 be used to detect leaks?



A: The Aqua M300 PWG mode is designed to be used together with our PWG devices. It is a great method for acoustic pipeline locating. This mode uses a fundamentally different underlying principle: It shows the highest detected peak noise level (leak detection modes show the highest persisting noise level). PWG mode is therefore unsuitable for leak detection.

Q: What types and sized of pipes can the PWG be used on?

A: The PWG can be used on both, mains and house connections.

Q: Can the PWG be operated with higher pressures than specified (above 8 bars)?

A: Yes, this is possible but with the risk of damaging the internal valve. The internal valve can easily be replaced and there is a spare valve with every new device.

Q: Can the PWG cause damage?

A: The PWG is basically just a valve, opening and closing in rapid succession. The stress put on the network and the pipes does not significantly exceed regular operation.

Q: Should the PWG be operated on a closed line (under pressure) or an open line?

A: Both is fine.

Q: What's the typical range for the PWG on PE/PVC pipes?

A: This depends on pipe diameter and water pressure. The higher the pressure and the smaller the diameter, the further the soundwaves will propagate. About 500-600m should be possible with high pressure.

## PipeMic® Series

Q: Is the ball on the PipeMic® Flex designed to be removed for smaller diameters?

A: Yes the ball can be removed. The rubber head has a 10mm diameter. Our standard ball is DN 16mm and we also offer a DN 12mm version.

Q: Will the PipeMic® Flex navigate a 90° bend in a 25mm pipe?

A: Yes, the PipeMic® Flex can manage several 90° bends in a row.



Q: What are the different available PipeMic® options?

A:

PipeMic® Product Family			
	Length (available)	Rod diameter	Strengths and typical applications
PipeMic® Flex	50m (40-90m)	4.5mm rod	Very flexible, ideal for house connections (Pipe DN: 12-80mm)
PipeMic® M	50m (40-90m)	4.5mm rod	Flexible for small and medium diameters (Pipe DN: 20-150mm)
PipeMic® XL	100m (80-150m)	9mm rod	Less flexible for medium and large diameters (Pipe DN: 80-350mm)
PipeMic® XXL	300m (160-500m)	9mm rod	Same as XL but longer

Q: Can the PipeMic® Flex get around 90° bends with DN 12mm pipes?

A: No, for such small DN's the metal ball has to be removed, without the ball the PipeMic® Flex can only manage straight pipes or very wide bends.

Q: What are recommended steps if the PipeMic® gets stuck?

A: Don't apply static force. Push the rod a bit further and try to pull it back. It is more likely that the sensor head will pass an obstacle while in movement.

Q: Is it possible to use a wired speaker with the PipeMic®?

A: No, only with Bluetooth devices (headphones, speakers, etc.)

Q: What is the main purpose of the PipeMic® Flex, for which parts of the water network is it best suited for?

A: The PipeMic® Flex shows its strengths especially on small DN pipes such as house connections. It can be pushed through several 90° bends in a row. Our PipeMic® product family is especially strong when there is high ambient noise.

Q: How can the PipeMic® be pushed into the desired direction at T junctions?

A: When inserting the PipeMic at a hot tap or other T connections, you can use our insertion guide to direct the PipeMic® in the wanted direction. T junctions further into the pipe network are a different matter. As of now, you cannot control the direction.

Q: Do active underground electric cables or telephone cables interfere with the PipeMic®?

A: Not with the audio signal, but for the line locating function, there can be interference.





## Correlation - Lokal 400 / Lokal 200 PC

Q: Can the Lokal 400 correlate on HDPE material?

A: Yes. Any material propagates sound. In HDPE-Pipes the sound will not travel as far but correlations are possible. To increase the max distance between the sensors, hydrophone sensors can be considered.

Q: What are the sound velocities in different materials and different diameters?

A:

Sound velocities in m/s, depending on pipe diameter and material									
Pipe-DN (mm)	Asbestos-cement	Steel	ductile cast	Cast	Lead	PE hard	PE soft	PVC	Copper
12	1370	1395	1410	1330	1200	402	405	570	1156
20	1310	1380	1400	1326	1175	400	401	555	1100
30	1300	1375	1365	1324	1145	396	395	540	1030
40	1280	1370	1360	1320	1080	391	391	520	925
50	1250	1335	1345	1315	1050	389	386	480	820
60	1230	1300	1339	1310	1000	386	377	470	760
80	1200	1281	1327	1300	900	379	369	460	680
100	1150	1265	1303	1270	800	372	359	440	540
125	1120	1247	1275	1260		364	346	430	
150	1100	1233	1254	1240		355	333	420	
175	1090	1215	1233	1233		347	320	410	
200	1080	1202	1218	1220		338	307	400	
250	1070	1180	1189	1180		321	281	390	
300	1050	1166	1166	1170		304	255	380	
400	1020	1130	1129	1129		270	203	370	
450	1000	1099	1115	1113		253	177	365	
500	1000	1078	1103	1100		236	151	360	
600	980	1033	1082	1082		202	99	348	
800	960	970	1053	1077		134	50	324	
1000	950	910	1033	1053		66	10	300	

Q: Can I rely on a measured sound velocity when uncertain about the pipe material?

A: If the pipe material and pipe diameter are not the same across the whole section where the correlation is conducted, with an average sound velocity the results will not be meaningful.

Q: How to make use of the average sound velocity that can be measured with the Lokal 200PC?

A: If the material and the DN are known to be consistent across the measurement section, the average velocity can help to double check if the assumed speed of sound is correct.



Q: What is the smallest distance between two correlation sensors?

A: 10m

Q: What is the max distance between sensors?

A: 1000m

Q: When should I choose to apply pre or post amplification with the MB 6 Pro?

A: If the auto-mode results in an undesired amplification level, manual amplification can result in better outcomes.

Q: Do I have to use the same filter settings on both measuring boxes?

A: If the frequency ranges are not overlapping (e.g. 0-300Hz and 600-1200Hz) a correlation won't be successful. With different, but overlapping filter ranges, meaningful results are still possible. We recommend using the same filter ranges on both MBs.

Q: Which leak would the correlator find if there are two leaks on the pipeline between the two measuring boxes?

A: The correlator will point to the loudest leak, which is not necessarily the biggest.

Q: When is the normal MB 6 and when the MB 6 Pro recommended, what about MB 4?

A: The MB 6 (normal and Pro) replace all previous MBs. The normal MB 6 will suffice for most cases as it already has advanced filter options and automatic amplification. Having the manual options of the MP 6 Pro is only recommended for professionals who do correlation on a daily basis and have a lot of experience.

Differences between MB 4, MB 6 and MB 6 Pro			
	MB 4	MB 6	MB 6 Pro
Display	Noise Level	Noise Level, Frequency Range	Noise Level, Frequency Range
Pre-Filter Amplification	Automatic	Automatic, Manual	Automatic, Manual
Post-Filter Amplification	Automatic	Automatic	Automatic, Manual
IP-Rating	54	68	68
Filter Options	2	5	Customizable in 50 Hz steps

Q: How does auto sound velocity recalibration work?



A: A leak noise (or other loud noise) has to be generated outside of both MBs. The Lokal 200 PC will then calculate the speed of the sound, based on time it takes for the noise to pass the first MB and reach the second one. For this method to be successful you need to know the exact distance between the two MBs.

Q: What distance range will the Lokal correlators with the MB 6 cover?

A: The radio signal can be more than 1.5 km with a clear line of sight (less with buildings and vegetation). Correlations can be successful for distances up to 1 km in ideal conditions.

## Noise Loggers - BIDI Logger

Q: Is there an iOS BIDI Logger app?

A: At the moment there is only an Android app. At the moment we are focusing on adding more functionalities to the Android app.

Q: How do the different transmission power settings for the BIDI-Logger (high, medium, low) translate to free field reception ranges?

A: Low: 40m, Medium: 60m High: 80m

Q: Can the BIDI Logger have transmission issues when the battery is almost empty?

A: Yes, the BIDI Logger needs at least 3.2 Volts to operate as expected. If voltage falls below this value, the logger will transmit a battery low status (if set up correctly).

Maximum charge	3.6 V
Optimal charge	3.2 - 3.6 V
Low battery	<3.2 V

Q: How long are the BIDI-Logger audio noise recordings?

A: 3 seconds for the nightly recording.

Q: How far away can the ServiceMaster still pick up the BIDI Loggers?

A: This is highly dependent on the application. If the logger is in a manhole, the transmission distance is much shorter. In free field the distance is max. 80m.

Q: What's the difference between noise level and audio recording?



A: The noise level is a numeric value between 0 and 99. This value represents the lowest persisting noise level. It should always be interpreted as a relative value with respect to the previous values at the same spot. The daily audio recording serves a different purpose. It helps to differentiate regular traffic or other ambient noises from a leak noise. Experienced professionals can use the noise file to examine the situation and make more informed decisions.

Q: How many noise level values can the BIDI Logger record/store?

A: Our BIDI Loggers have enough internal storage for thousands of measurements. Currently you can receive the last 14 days with the ServiceMaster. In the future we plan to implement more read out options.

Q: How many audio recordings will the BIDI Logger store?

A: The audio file is only kept one day and will be overwritten each time a new one is recorded. The audio file can be pulled manually through the AZA-OAD Android app.

Q: How many correlations will be stored in the BIDI Logger?

A: One correlation will be stored until the next correlation overwrites it.

Q: Can the BIDI Loggers be programmed to do a correlation at night without supervision?

A: Yes. The correlation has to be scheduled through the AZA-OAD Android app. The time for the correlation can be chosen freely within the next 48 hours.

Q: Does the BIDI Logger need a recorded sound file to do a correlation?

A: The logger can only use noise files that have a synchronized time stamp for calculating a correlation. The nightly noise recordings can therefore not be used for correlations

Q: Do you offer assistance in the setup of the BIDI Loggers?

A: We consider good service and customer support as one of our core strengths. We'd be happy to assist you with optimal logger placement. Please contact us and we will do our best to improve your result.

Q: What's a recommended distance between each BIDI Logger to guarantee a good coverage of the network?

A: This depends on material and pipe diameter. One BIDI Logger every 300-500 Meters would be our broad suggestion for steel pipe networks.



Q: How far will the leak noise usually propagate?

A:

Leak noise propagation with 4-6 bar pipe pressure and a reasonable sized leak (at least 3-4mm) for normal body sound sensors							
	DN 50	DN 100	DN 200	DN 400	DN 600	DN 800	>DN 800
Ductile Iron	1000m	800m	500m	150m	100m	60m	30m
Cast Iron	1000m	800m	500m	150m	100m	60m	30m
Steel	1200m	900m	600m	170m	120m	70m	35m
Concrete (asbestos)	800m	500m	230m	130m	80m	50m	20m
GRE (glass fiber)	1200m	900m	600m	170m	120m	70m	35m
PVC	50m	45m	40m	30m	-	-	-
PE	40m	35m	30m	20m	-	-	-

Q: How does a BIDI Logger with LoRa transmit a signal from inside a 3 Meter deep manhole?

A: Our BIDI Loggers with LoRa use very low band frequencies which are well suited for such applications and can even get through in such challenging situations.

Q: Can the BIDI Loggers transmit other frequencies?

A: Yes, we do offer 915 MHz for the US market. Please contact us if you are interested in BIDI Loggers with a frequency other than 433 MHz.

## Object Locating - MD 100

Q: How deep can the MD 100 detect objects?

A: Up to 2 Meters max.

Q: Does the MD 100 use GPR for object locating?

A: The MD 100 doesn't use radar, for object locating.

## H<sub>2</sub> Tracer Gas - GasCheck / GasDiffuser

Q: What are the advantages of FASTs Hydrogen tracer gas method over other tracer gases such as Helium?

A: The 5% Hydrogen / 95% Nitrogen compound we use as tracer gas has several advantages: It is broadly available since it is also used for welding. It is much cheaper than other tracer gases. The



Hydrogen mix is absolutely safe, when used in the recommended 5% concentration, this mix is neither flammable nor is it explosive. Helium is much more expensive and it has a higher background concentration which makes false positive detections more likely. We consider Hydrogen the superior option.

Q: How long can the 5% Hydrogen / 95% Nitrogen tracer gas be stored in the cylinder?

A: The Hydrogen slowly diffuses through the steel walls of cylinder. Over time this will decrease the concentration of the Hydrogen. Since the GasCheck sensor is very sensitive and can even detect as low as 1 ppm, even a 1% Hydrogen / 99% Nitrogen mix will work fine as a tracer gas.

Q: Is a transport permit needed for Hydrogen cylinders?

A: The 5% Hydrogen / 95% Nitrogen tracer gas does not need a permit to be transported since it is not flammable, explosive or poisonous. It has to be kept in a separate compartment away from the driver.

Q: Can the leak be accurately pinpointed if there is a concrete (dense) layer on top of the leak location.

A: Dense layers of concrete/steel/etc. can pose a problem. Tracer gas will always follow the path of least resistance, which can result in flowing around dense material on top of the leak and showing high concentrations at the edge of this material. An individual site assessment considering all the materials is always advised before starting to dig.

Q: How long will Hydrogen tracer gas remain at the leak spot to be pinpointed and confirmed?

A: Since Hydrogen is a very light and volatile gas, it will not stay at the leak spot for long (a couple of seconds only). In order not to “miss” it, the tracer gas should be constantly inserted into the pipe until the leak is pinpointed.

Q: Does the Hydrogen tracer gas have to be introduced continuously while searching for the leak with the H<sub>2</sub> probe?

A: Yes the tracer gas should be left running while searching for the leak.

Q: Will Hydrogen tracer gas come through concrete and paved roads.

A: Yes. An advantage of hydrogen is the very small molecular size, it will move through any other material and be traceable on the surface. Although it will take longer until the hydrogen reaches the surface compared to soil/sand.



Q: How much tracer gas would be needed for a pipe diameter of 400 mm with a pipe length of 350 Meters and an operating pressure of 3 Bar (43.5 psi / 3000 hPa)?

A: In an empty pipe the amount of Tracer Gas (in Liters) is the total volume in Liters (of the closed off pipe section) multiplied by the operating pressure in Bar. In this case:

$V = (400 * 0.5 / 100)^2 * \pi * 350 * 10 = 43982$  Liters. One 50 Liter Formier 5 cylinder hold 10 000 Liters gas. In this case at least 5 cylinders are needed.

Q: Can Hydrogen tracer gas be applied with live pipes?

A: Yes this it is possible to use Hydrogen tracer gas on live pipelines. Our GasDiffuser has been developed to serve this purpose. It will mix the gas with the water and will prevent the buildup of large bubbles.

Q: How will Hydrogen tracer gas affect the water?

A: Hydrogen tracer gas has no effect on the water composition, quality or PH-Level what so ever. This has been confirmed by an independent testing laboratory.

Q: How quickly will Hydrogen tracer gas reach the surface?

A: This depends on the density of the material and on the depth of the pipeline. With an asphalt surface it can take up to 20 Minutes until the gas reaches the surface. In this case it is advised to drill small holes in the asphalt which will result in quicker and more accurate results.

Q: What's the smallest leak size detectable with Hydrogen tracer gas?

A: Hydrogen tracer gas can be successfully used to find the smallest leaks (dripping connections etc.).

Q: How to use tracer gas in windy conditions?

A: The Hydrogen bell probe has a built in wind protection (the bell).

Q: Where can the Hydrogen tracer gas be introduced when applied to on a live pipe utilizing the GasDiffuser?

A: There are no limitations where to apply H<sub>2</sub> tracer gas, the only thing to consider is the flow direction. The gas has to be carried by the water stream.

Q: How long does the H<sub>2</sub> sensor last?

A: When used once a week for leak detection, the sensor will last for at least one year.



Q: What purity grade of H<sub>2</sub> tracer gas should be used for leak detection?

A: There is medical grade, technical grade and industrial grade Hydrogen/Nitrogen gases. For leak detection the lowest and cheapest grade will suffice.

Q: How is the pressure and the amount of gas moderated when introduced with the GasDiffuser

A: We use only a regulator here, no gas meter. A basic gas meters can be used to optimize the amount of gas and reduce cost.

Q: At what pressure should the gas be introduced into the water stream, when using the GasDiffuser?

A: With the GasDiffuser the pressure of the tracer gas should be at least 1 bar higher than the actual water pressure.

Q: In case of hot tapping the pipe in order to introduce the tracer gas with the GasDiffuser, how big does the drill hole has to be?

A: The GasDiffuser head has a 12mm diameter. The drilled hole has to be slightly larger than that (at least 13mm).

Q: Does the GasDiffuser require a special coupling?

A: The GasDiffuser has a ¾" inch outer thread on the water lock. Connected to this is a "GEKA" coupler, which is not common outside of Germany. The GEKA coupler can easily be removed, which allows for more versatility with the ¾" coupler.

Q: Do high flow velocities need to be reduced by closing valves when using the GasDiffuser (e.g. at times of maximum consumption)?

A: This is not necessary.

Q: How can the mixing of the tracer gas into the water stream be improved, when using the GasDiffuser?

A: The goal is to have "high turbulence" and "high flow velocities" at the insertion point. Therefore, if a valve is close by it makes sense to partially shut it to create more turbulence.

Q: How far from the injection point can the H<sub>2</sub> tracer gas still be detected?

A: We have detected H<sub>2</sub> tracer gas as far as 18km after the insertion point. There is basically no limit to the distance. It should be considered that the H<sub>2</sub> tracer gas will go with the water stream.





Junctions and branches may lead the gas on a different than the desired path and it may not reach the leak spot.

Q: Is this H<sub>2</sub> tracer gas method only used in specific cases of leaks that were not detected by other means?

A: Yes, tracer gas is often considered the step of the last resort.